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2-2016

## **Captain Sinclair's Recreational Area Shoreline Management Plan**

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# **Captain Sinclair's Recreational Area Shoreline Management Plan**



Shoreline Studies Program  
Virginia Institute of Marine Science  
College of William & Mary  
Gloucester Point, Virginia

February 2016

# Captain Sinclair's Recreational Area Shoreline Management Plan

*Prepared for*  
*Middle Peninsula Planning District Commission*  
*And*  
*National Fish and Wildlife Foundation*

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Gloucester Point, Virginia



**February 2016**

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# 1 Introduction

Captain Sinclair's Recreation Area (CSRA) is located on the Severn River in Gloucester County, Virginia. It is a tract of land consisting of about 100 acres that was donated to the Middle Peninsula Chesapeake Bay Public Access Authority (Figure 1). Long-term goals for the property include active and passive recreational and research activities including several shoreline-based projects. The property has about 1.3 miles of tidal shoreline that extends from the canal on the northern end of the property, along Whittaker Creek, and to the Severn River down to small unnamed tidal creek adjacent to the old wood pier. Shoreline erosion, historically, is greater along the more open reaches of the Severn River. A living shoreline project and new pier were recently installed along the Severn River in front of the main house.

## 2 Existing Conditions

### 2.1 Physical and Geological Setting

CSRA has shoreline on the Severn River and Whittaker Creek. The upland region is very low and easily flooded during severe storm events (Figure 2). The maximum upland height is about 6 feet North American Vertical Datum 88 (NAVD88) and consists of Holocene deposits. The lowest area is marsh at the point of land where Whittaker Creek joins the Severn River. Most of the marsh was only 0 to 1 foot NAVD88 in 2010. The nearshore is very shallow with the five foot mean low water (MLW) contour about 1,900 feet offshore. Offshore of the point of land at the confluence of Whittaker Creek and the Severn River, the 1 foot contour is over 1,000 feet offshore meaning the nearshore is very shallow.

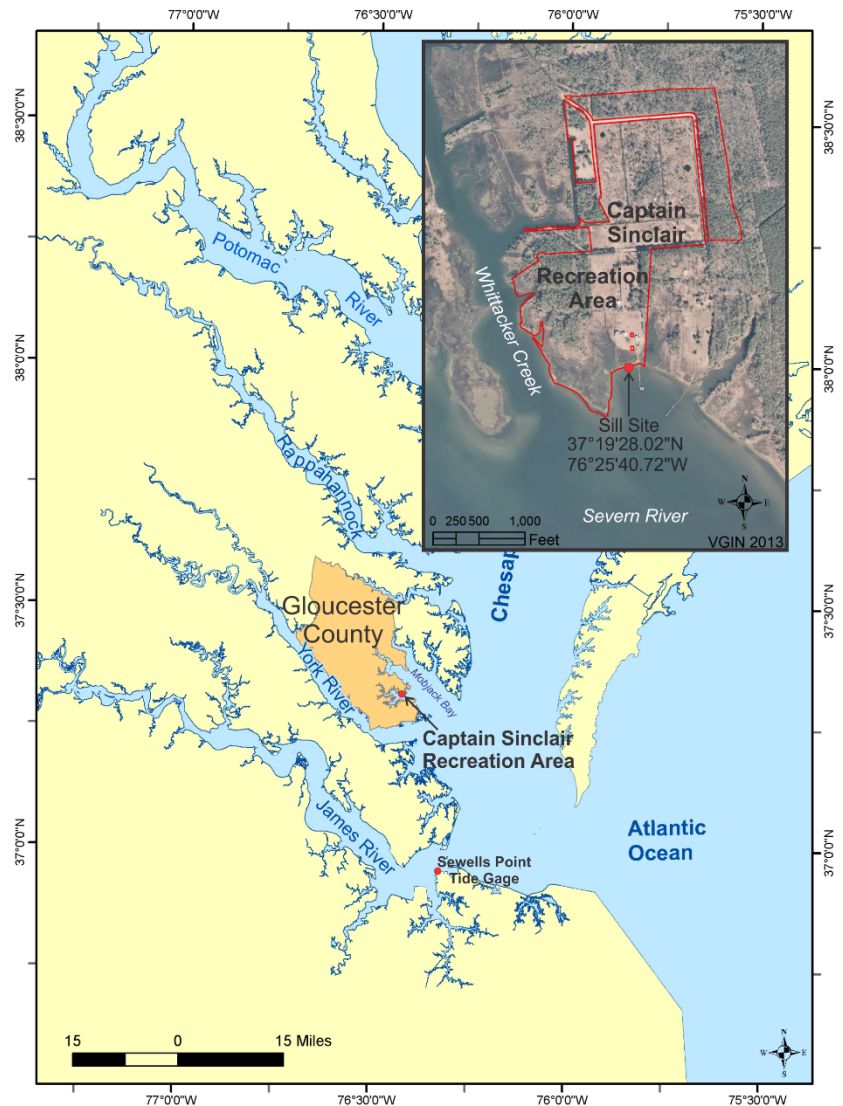


Figure 1. Location of Captain Sinclair's Recreation Area within the Chesapeake Bay estuarine system.

In 1960, the CSRA shoreline was tidal marsh fronting the low wooded upland along Whittaker Creek and farm (Figure 3). Sometime between 1960 and 1968 extensive excavation and filling was done around much of the property. The shoreline along Whittaker Creek was most impacted with the excavation of the long canal where the present day boat ramp resides. Also two marsh headlands were filled, and two short canals were created (Figure 3). Today these filled areas have re-vegetated with upland species including shrubs, cedars, and pines. A small tidal pond was formed on the land side of southerndeposited sand. It connects to Whittaker Creek by a narrow meandering tidal inlet. The two small canals on Whittaker Creek have filled in at their mouths and act like small tidal ponds (Figure 4). The southern filled marsh headland is now an eroding upland bank, and the site of two duck blinds.

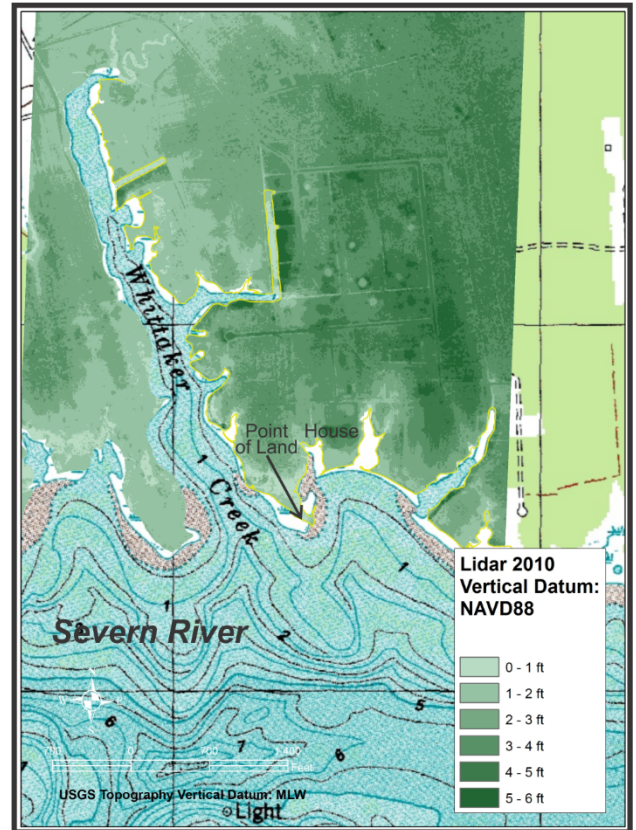


Figure 2. Virginia Base Mapping Program's LiDAR digital elevation model data from 2010 overlaid on a U.S.

Farther south along the rest of Whittaker Creek and into Severn River, the broad marsh peninsula has experienced higher erosion rates than other areas of the property due to its long fetch exposures to the southwest, south, and southeast of 2 miles, 0.8 miles, and 1.6 miles, respectively. Turning northward along the shoreline, a small tidal creek was once protected by a marsh spit but is now completely open (Figure 4).

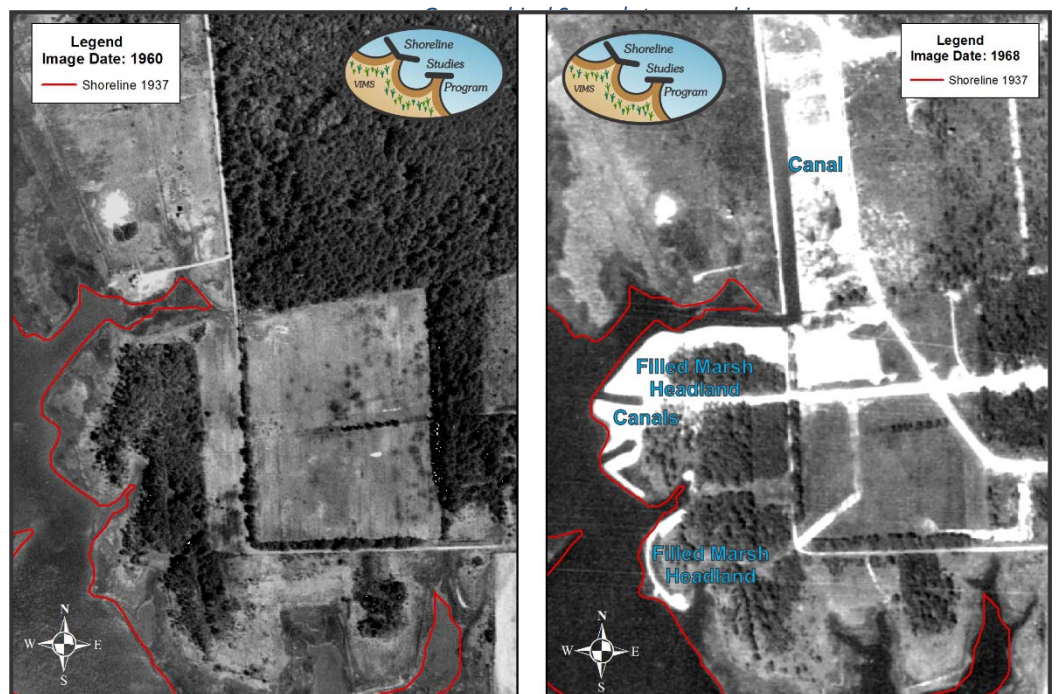


Figure 3. Shoreline Studies Program rectified aerial mosaics from 1960 and 1968 showing the dredging of canals at the site and subsequent placement on the upland.



The last reach of shoreline lies along the riverside of the house. It is a broad eroding marsh that appears to have been filled to some degree over time. The main house and several out buildings can be seen in 1978 imagery (Appendix A). In 1994, two long piers extended from the upland out into the Severn. These can be seen in 2002, but by 2006, the western pier was gone, possibly as a result of Hurricane Isabel in 2003. A new pier with floating dock extension was built in 2015 since the older pier is deteriorating. Today, the eroding marsh edge in front of the main house has been secured by a stone sill system (Appendix B) that was built in January/February 2016.

## 2.2 Shore Conditions and Change

CSRA has about 1.3 miles of shoreline along Whittaker Creek and the Severn River. This does not include the privately owned properties that are situated between CSRA shoreline reaches (Figure 1). The historic shorelines between 1937 and 2013, and the calculated rate of shoreline change are shown in Appendix A. For most of the shoreline, the long-term rate of change is very low erosion or very low accretion along Whittaker Creek. The only areas that have low or medium erosion are where the canals were dug. Along this reach of shoreline, the low erosion rate has created small erosional marsh scarps along the shoreline or left trees and shrubs near the shoreline.

The point of land at the confluence of Whittaker Creek and the Severn River has had the highest erosion rate. Approximately 210 feet of marsh has eroded along the southwest facing side of the point (Appendix A). Erosion on the eastern side of the point has broken through a marsh spit that fronted the small tidal creek (Figure 5). In addition to wind/wave erosion, infrared photography in 2013 appears to show areas of non-channelized inundation within the marsh (Figure 5).



Figure 4. Present shore conditions as depicted by Shoreline Studies Program's April 2015 rectified aerial photo mosaic overlaid on a Virginia Base Mapping Program 2013 image.



### 2.3 Tide Range and Sea-Level Rise

The mean tide range is 2.4 feet at Captain Sinclair. Storm surge frequencies for the 10, 50, and 100 year events are 3.9, 5.4, and 6.2 feet NAVD 88, respectively. These stillwater elevations adjusted to MLW for the 10, 50, and 100 year return levels are 5.4, 6.9 and 7.7 feet (FEMA, 2010).

Sea-Level rise was calculated to be 3.81 mm/year (NOAA Tides and Currents, 2016). At this rate, by 2050, 0.4 ft of sea level rise will occur. NOAA's Sea Level Rise and Coastal Flooding Impacts (NOAA, 2016) interactive mapping tool showed the extent of 1 foot of sea level rise on Captain Sinclair (Figure 6). Generally, the low marshes are the areas that will be impacted most by sea-level rise at CSRA. However, the upland is low enough that the marsh may be able to migrate landward with sea level.

### 2.4 Marine Resources

Submerged aquatic vegetation (SAV) is dense along the nearshore of CSRA (Figure 7) as determined by the Virginia Institute of Marine Science's Submerged Aquatic Vegetation program. Because the SAV is close to the shoreline, any shoreline management recommendations for this property must take it into consideration. A great deal of oysters are distributed throughout the marsh around the property.

## 3 Shoreline Management

In low energy environments such as those along Whittaker Creek, recommended shoreline management options often do not require the use of large, hard structures. In medium energy settings such as those along the Severn River, structural living

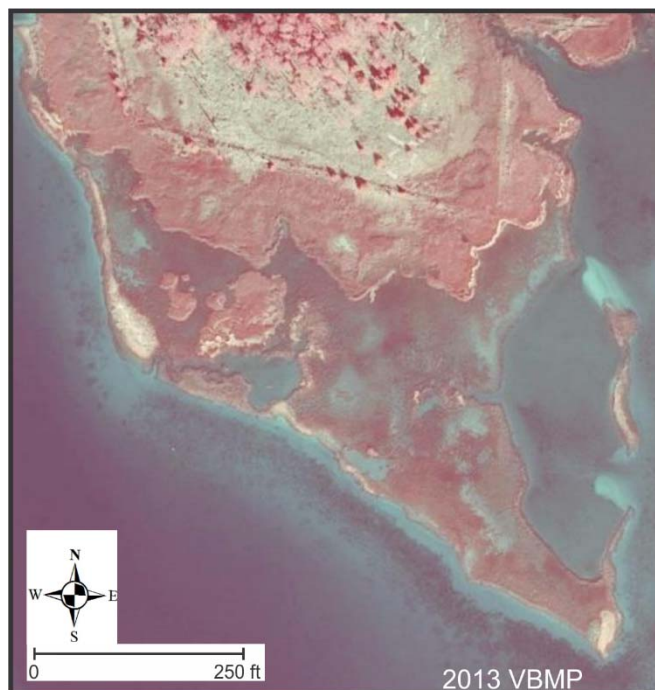


Figure 5. Virginia Base Mapping Program's 2013 infrared aerial photo mosaic showing inundation of the marsh at CSRA.



Figure 6. NOAA's sea-level rise and coastal flooding impact viewer showing areas (in blue) affected by a projected 1 foot inundation at CSRA.

shoreline management strategies may be required. Several living shoreline projects have been completed or are being planned for sections of CSRA that had been previously identified as eroding (Appendix B).

Along the main section of Severn River shoreline in front of the house, four sills with three windows and sand fill were built to protect an existing eroding marsh as well as provide recreational access. This living shoreline project was designed, permitted, and bid for construction by the Shoreline Studies Program at the Virginia Institute of Marine Science. It was funded by a grant through the Middle Peninsula Planning District Commission from the National Fish and Wildlife Foundation. Construction of the project began in January 2016 and was completed in February 2016 by Coastline Design and Construction, Inc. Grasses have not been planted as of the writing of this report since they have to be planted in the spring to ensure survival. Planting with *Spartina alterniflora* and *Spartina patens* will commence in April/May 2016.

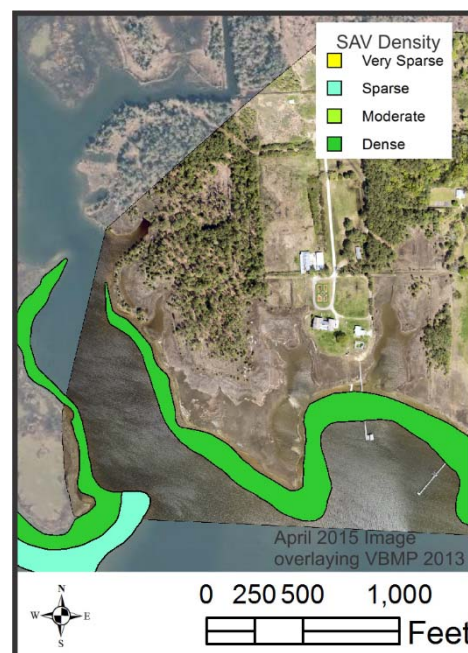


Figure 7. Submerged aquatic vegetation density mapping from the VIMS SAV program for 2014.

A second, smaller living shoreline project is in the permitting phase (Appendix B). This project includes a total of 60 feet of log sections that will be anchored along a section of eroding shoreline on Whittaker Creek (Figure 8). This section of shoreline was converted to upland when material was placed on it during the dredging of the canals that occurred in the 1960s (Figure 3). It is now a low, exposed bank vegetated with trees and shrubs. Just north of the logs, an eroding marsh scarp will be stabilized with stacked oyster bags. Approximately 60 feet long, the oyster bags will buffer waves and help maintain the marshes edge. It is anticipated that this project will occur in March 2016 once permits are received.

In order to determine existing conditions along the shoreline, the site was visited on foot, and photos showing the state of the shoreline are in Appendix C. The existing/permitted shoreline management projects are shown on Figure 8. Along Whittaker Creek, north of the oyster bag living shoreline project that is underway, the shoreline has minimal erosion and much of the shoreline is privately owned. The exception is just north of the area where the oyster bag sill will be installed. The oyster bags could be continued in order to maintain the marsh edge.

South of the proposed living shoreline projects on Whittaker Creek, the shoreline is considered erosional. The marsh spit that exists at the mouth of the tidal pond is decaying (Appendix C3 and C5). Once the spit disappears, the tidal creek will be exposed to a slightly larger wave climate and could cause erosion. A duck blind



occurs along the shoreline (Appendix C4). South of the spit, the shoreline region consists of high and low marsh (Appendix C7 and C9). Utilizing oyster bags as a sill along the marsh fringe would help maintain the marsh edge.

Farther south, the high marsh gives way to low marsh that floods at high water (Appendix C8). The low marsh of the point is rapidly eroding, particularly on its southwest facing side. While a rock sill would manage the erosion, it is not feasible to bring in the necessary rock and sand since there is no access from the land side and the nearshore is too shallow. Oyster bags, or some other type of product that is light and could be brought in via small boat, could be placed along the shoreline to try and maintain the marsh. However, the longer fetch distances at the site will mean that maintenance of the project may be required.

The east facing shoreline has a spit that is eroding (Appendix C10). One section has breached and another section has no marsh but is only a sand washover (Appendix C11). An oyster bag sill could be effective in helping to maintain the spit which would protect the low marsh behind it. Placing oyster bags along the marsh edge behind the breach could help maintain the marsh before it starts being impacted by erosion.

In the small tidal creeks on either side of the house, erosion is minimal (Appendix C12 and C13). However, placing oyster bag sills in strategic locations could reduce problems in the future by helping to maintain the marsh.

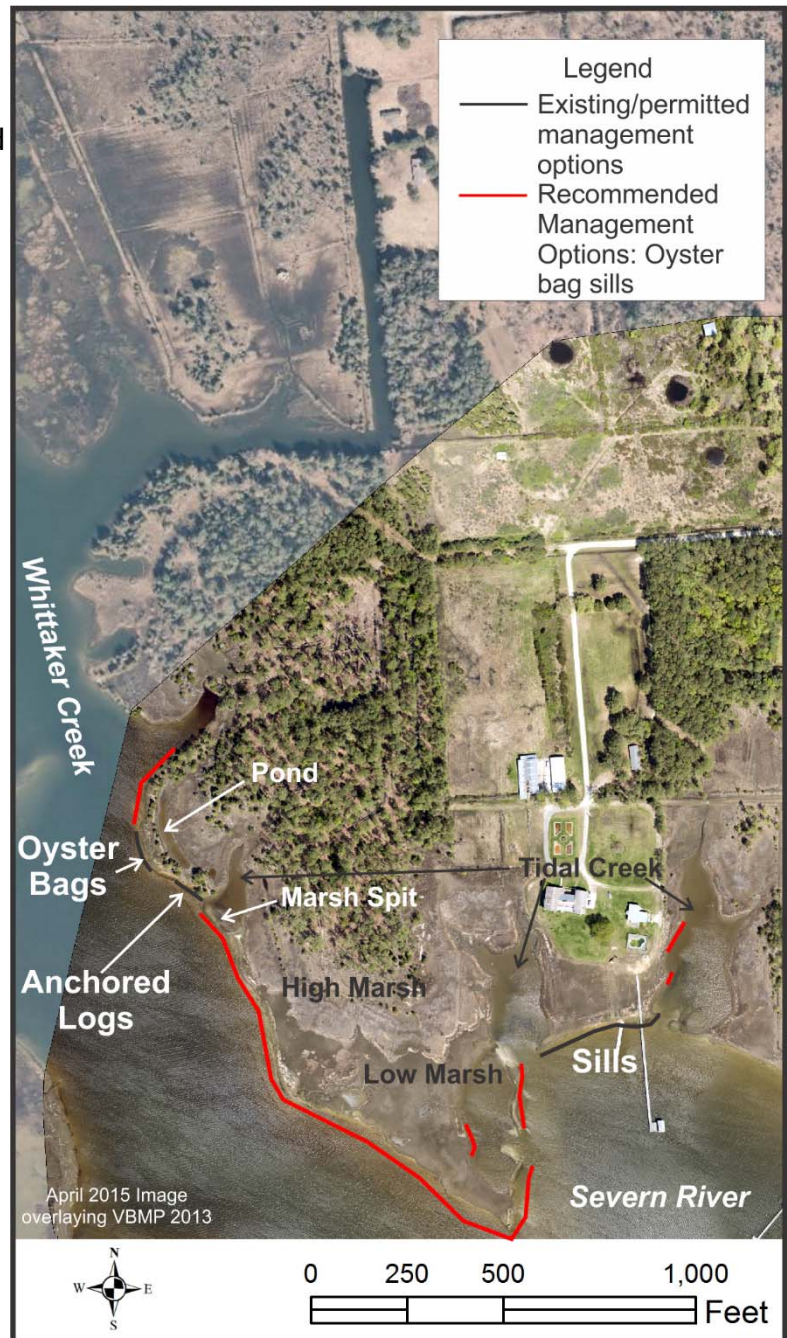


Figure 8. Existing living shoreline project locations and recommended locations for future locations.

## 4 Summary

CSRA is a recreational area in Gloucester County, Virginia which has about 1.3 miles of shoreline most of which is marsh. Much of the shoreline has a low erosion rate with the exception of the low marsh at the confluence of Whittaker Creek and Severn River. Between 1937 and 2013, the point was eroding at about 2.5 feet/year.

The upland is low, not over 6 feet NAVD88, and the nearshore is very shallow. Sea level rise will have an effect on the low marshes of the site over the next 50 years. Presently, oysters and SAV are plentiful marine resources at the site.

Overall, the sections of eroding shoreline at CSRA have either been addressed or will be addressed. The four rock sills with windows and sand fill that was built in front of the main house protects a wide, low marsh. The log and oyster bag projects on Whittaker Creek will reduce erosion along one filled headland. Other areas on Whittaker Creek and the Severn River can be protected with oyster bag sills. While they may not be completely effective along the eroding point, they may help in an area where larger structures could not be built due to access issues.

## 5 References

FEMA. 2010. Flood Insurance Studies Gloucester County, Virginia and incorporated areas. Federal Emergency Management Agency.

NOAA. 2016. Sea level rise and coastal flooding impacts viewer. Retrieved February 2016. [coast.noaa.gov/slr/](http://coast.noaa.gov/slr/)

NOAA Tides and Currents. 2016. Mean sea level trend, Gloucester Point, Virginia. National Oceanic and Atmospheric Administration. Retrieved February 2016. [http://tidesandcurrents.noaa.gov/sltrends/sltrends\\_station.shtml?stnid=8637624](http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8637624)



## **Appendix A**

Historic and Recent Rectified Photos  
Digitized Shorelines  
Calculated Rates of Change



**Captain  
Sinclair**

*Whittaker Creek*

**Legend**  
**Image Date: 1937**

— Shoreline 1937

*Severn River*







**Captain  
Sinclair**

*Whittaker Creek*

**Legend**  
**Image Date: 1953**  
— Shoreline 1953

*Severn River*







**Captain  
Sinclair**

*Whittaker Creek*

**Legend**  
**Image Date: 1960**

— Shoreline 1960

*Severn River*



400 0 400 800 Feet





**Captain  
Sinclair**

*Whittaker Creek*

**Legend  
Image Date: 1968**

— Shoreline 1968

*Severn River*







Captain  
Sinclair

Whittaker Creek

**Legend**  
**Image Date: 1978**

— Shoreline 1978

Severn River

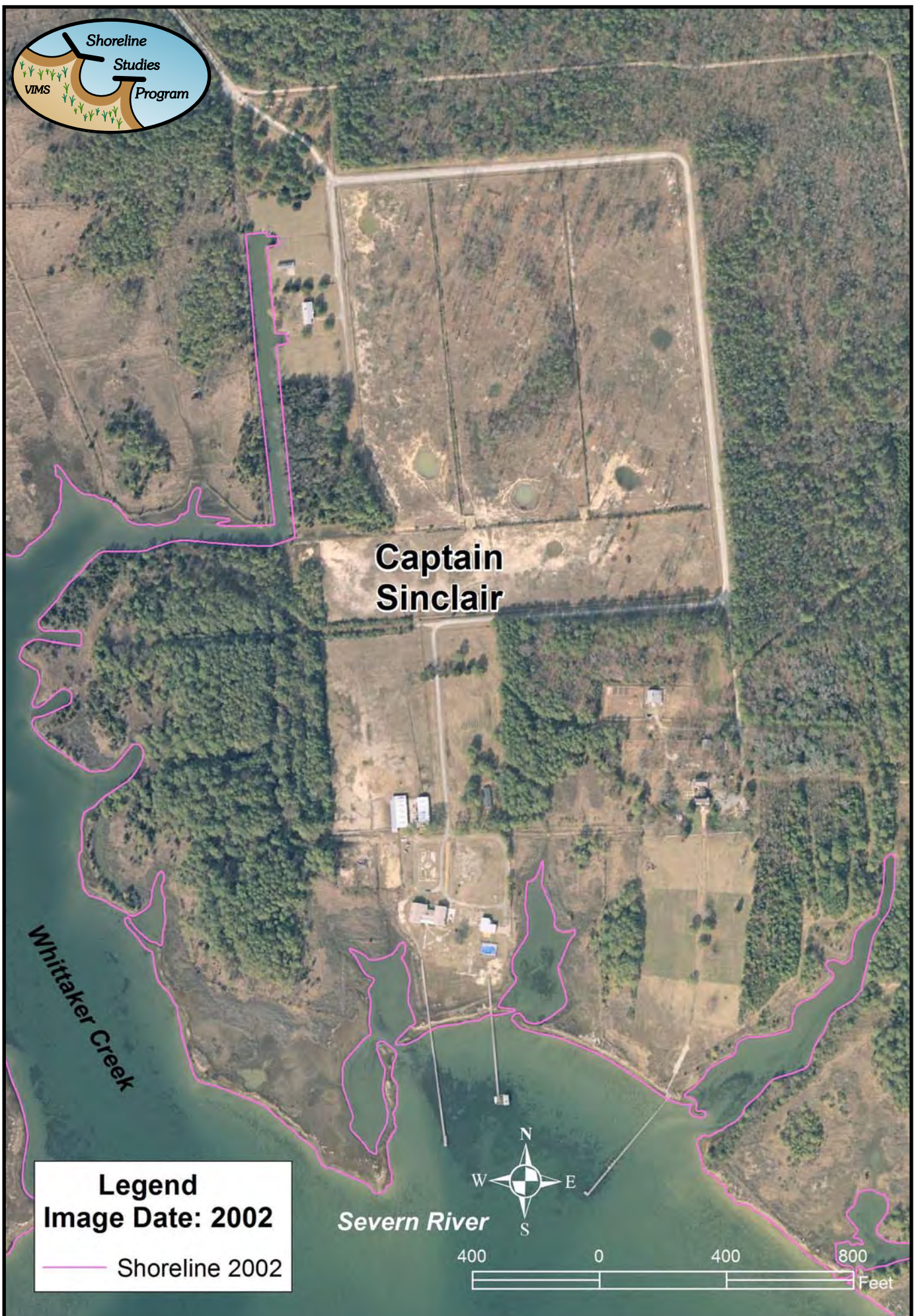
400 0 400 800 Feet















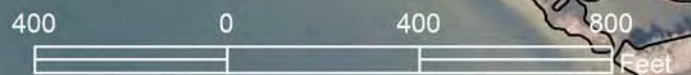
**Captain  
Sinclair**

*Whittaker Creek*

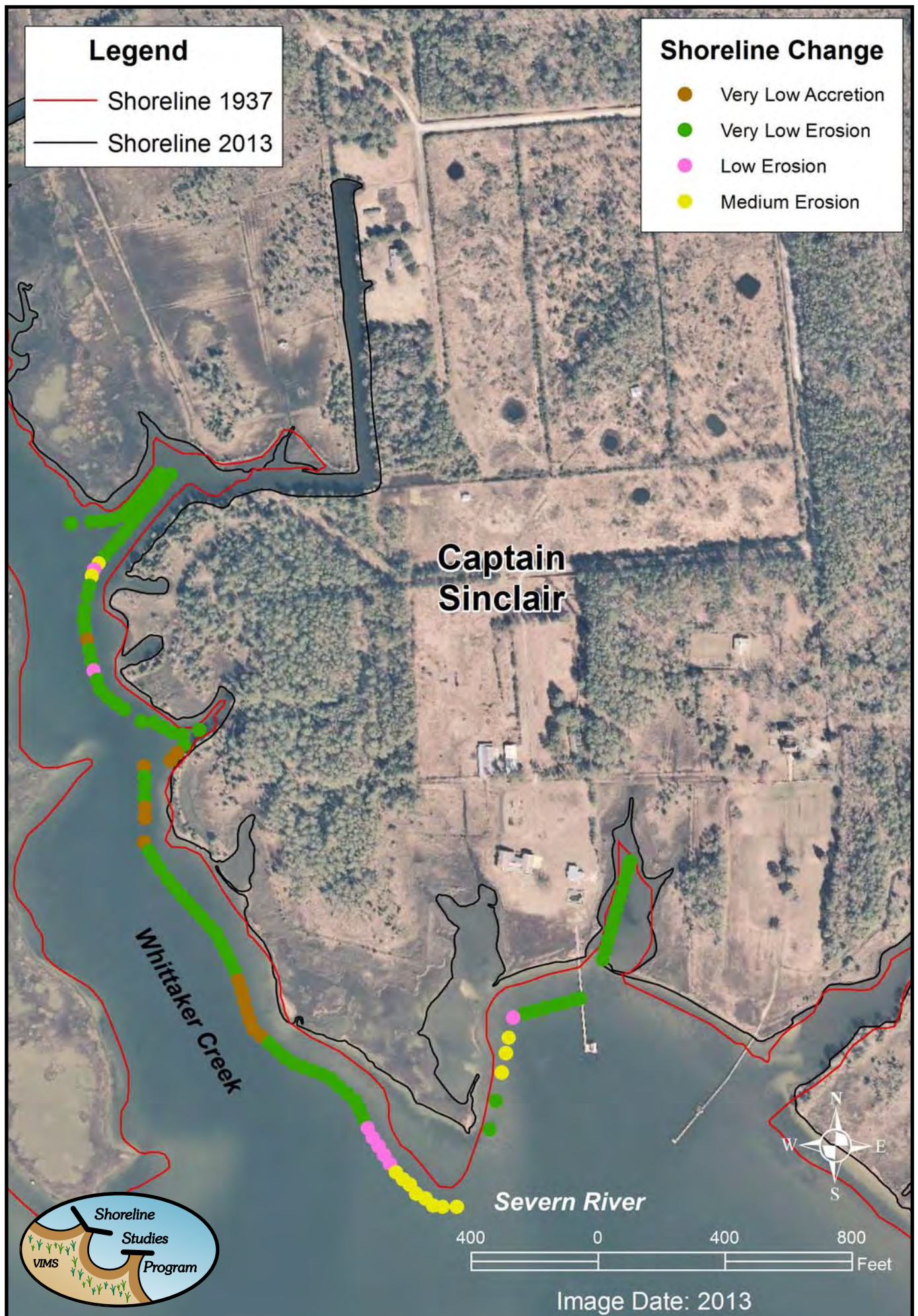
**Legend**  
**Image Date: 2013**

— Shoreline 2013

*Severn River*







## **Appendix B**

Living Shoreline Projects  
Preconstruction information  
Design  
Post-construction photos





Shoreline before living shoreline construction. *Spartina alterniflora* exposed along the eroding shoreline.

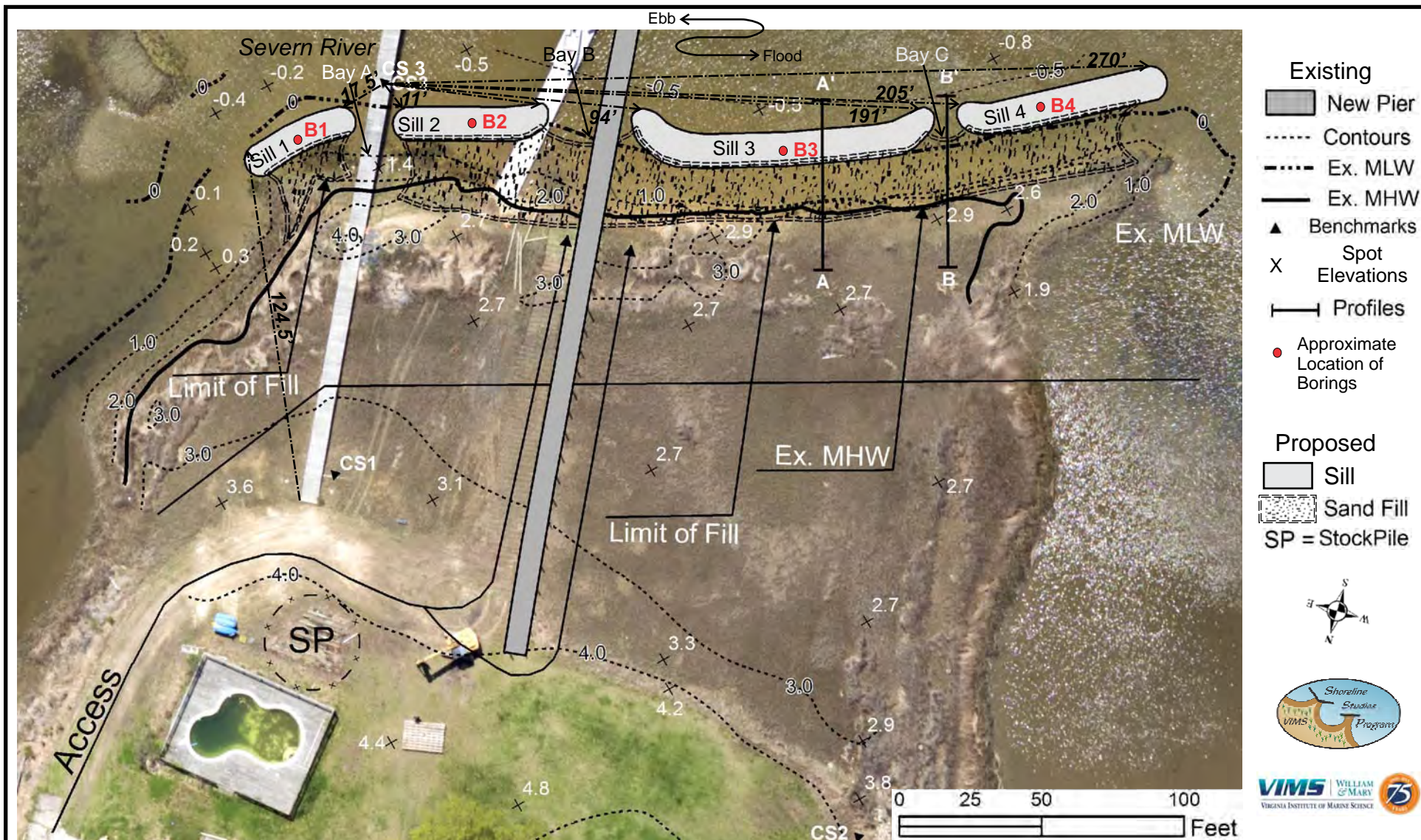


Shoreline before living shoreline construction. Marsh scarp along the main shoreline.



Shoreline before living shoreline construction. The new pier has since been completed. 24 April 2015





ADJACENT PROPERTY OWNERS:

Captain Sinclair Living Shoreline Project Planview

APPLICATION BY:

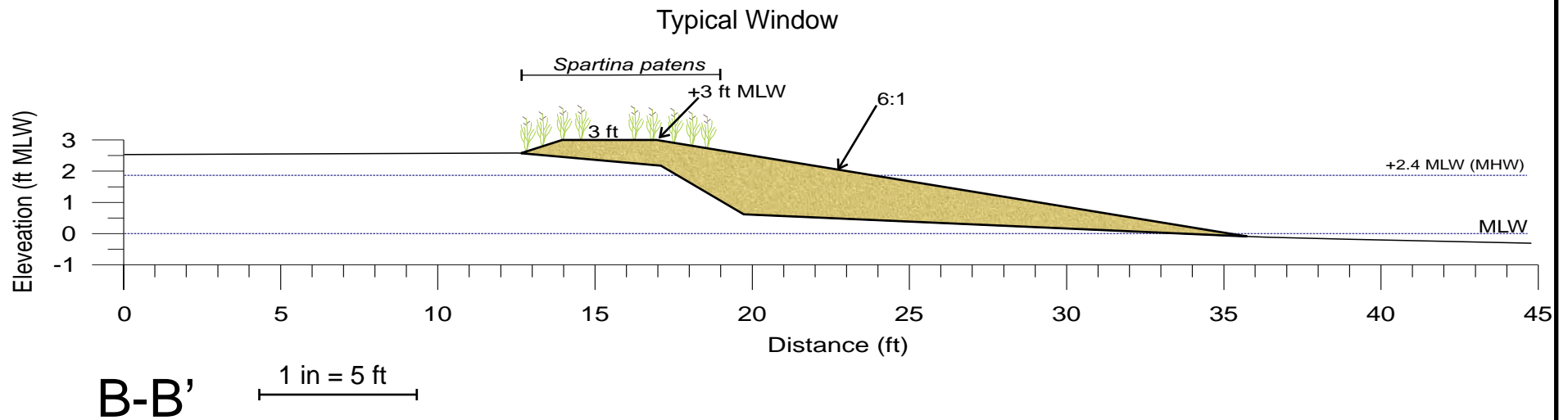
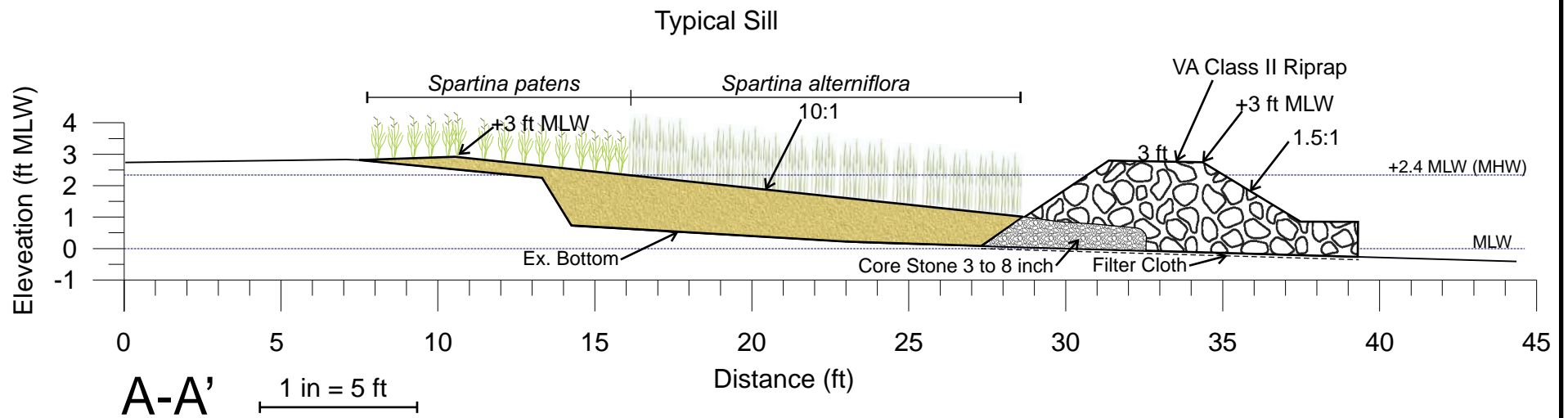
DATUM:

AT:  
IN:

PURPOSE:

DATE:

SHEET



ADJACENT PROPERTY OWNERS:

DATUM:

### Captain Sinclair Living Shoreline Project Cross-Sections

AT:  
IN:

PURPOSE:

APPLICATION BY:

DATE: 7/15/2015

SHEET





Post-Construction:  
Sill 2

Note: Sand will not  
be planted until  
after April 15 to  
ensure survival.



Post-Construction:  
Sill 3



Post-Construction:  
Sill 1



Post-Construction:  
Window between  
sills 3 and 4



Post-Construction:  
Sand fill up to the  
top of existing  
marsh scarp.

The sand behind  
the structures will  
be planted with  
marsh grass after  
April 15.



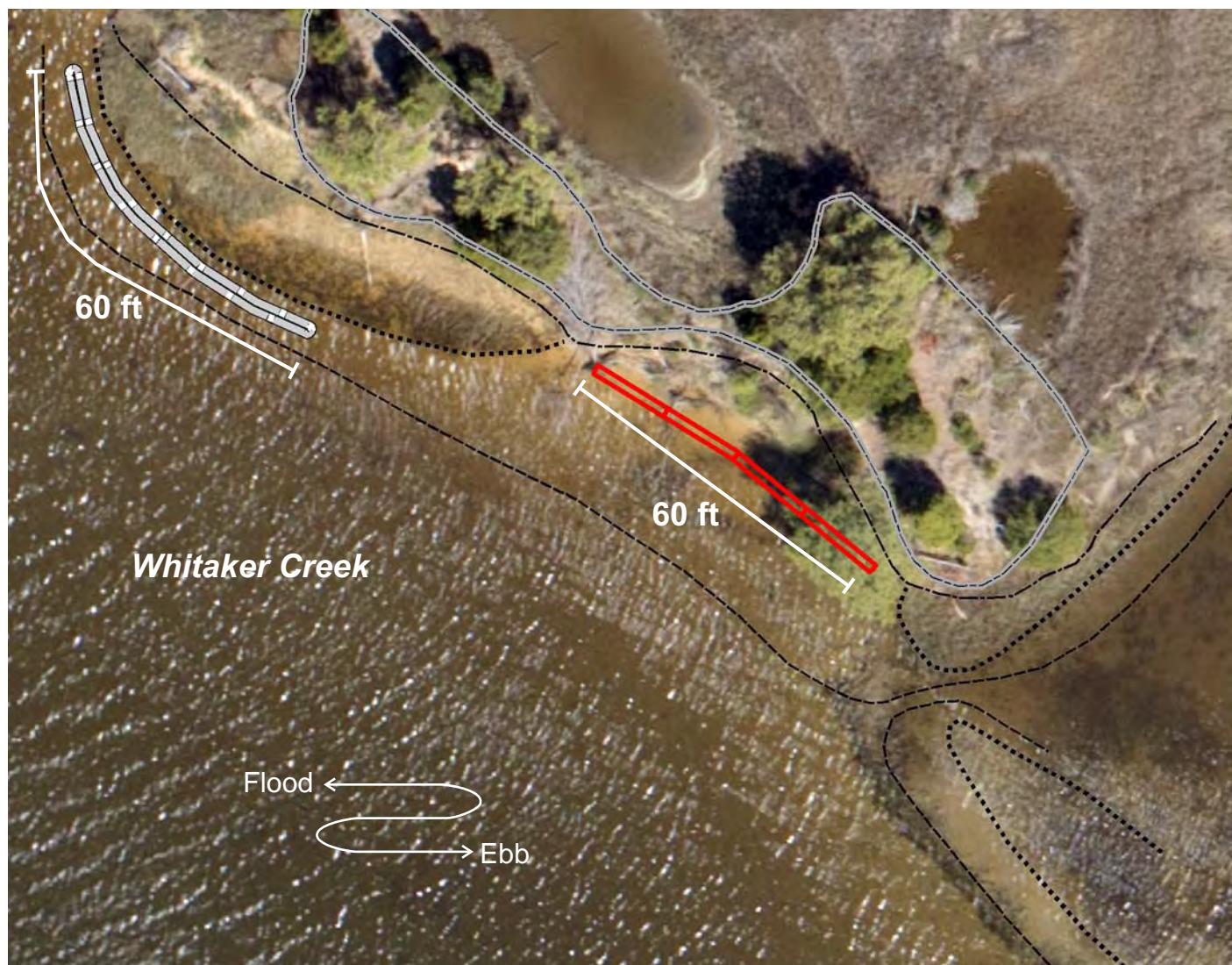


Whittaker Creek Living Shoreline project is in the permitting phase. Logs totalling 60 feet in length will be placed along the shoreline and anchored as per the design and cross-sections on the following pages.

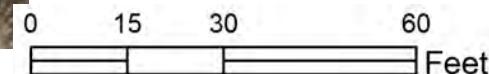


Whittaker Creek Living Shoreline project is in the permitting phase. Oyster bags totalling 60 feet in length will be placed along the eroding marsh scarp as per the design and cross-sections on the following pages.





- Existing**
- Upland
  - ..... Edge of Marsh
  - - - MHW
  - - - MLW
- Proposed**
- Logs
  - ▨ Oyster Bags



ADJACENT PROPERTY OWNERS:

# Captain Sinclair Whittaker Creek Living Shoreline Project Planview

APPLICATION BY:

DATUM:

AT:  
IN:

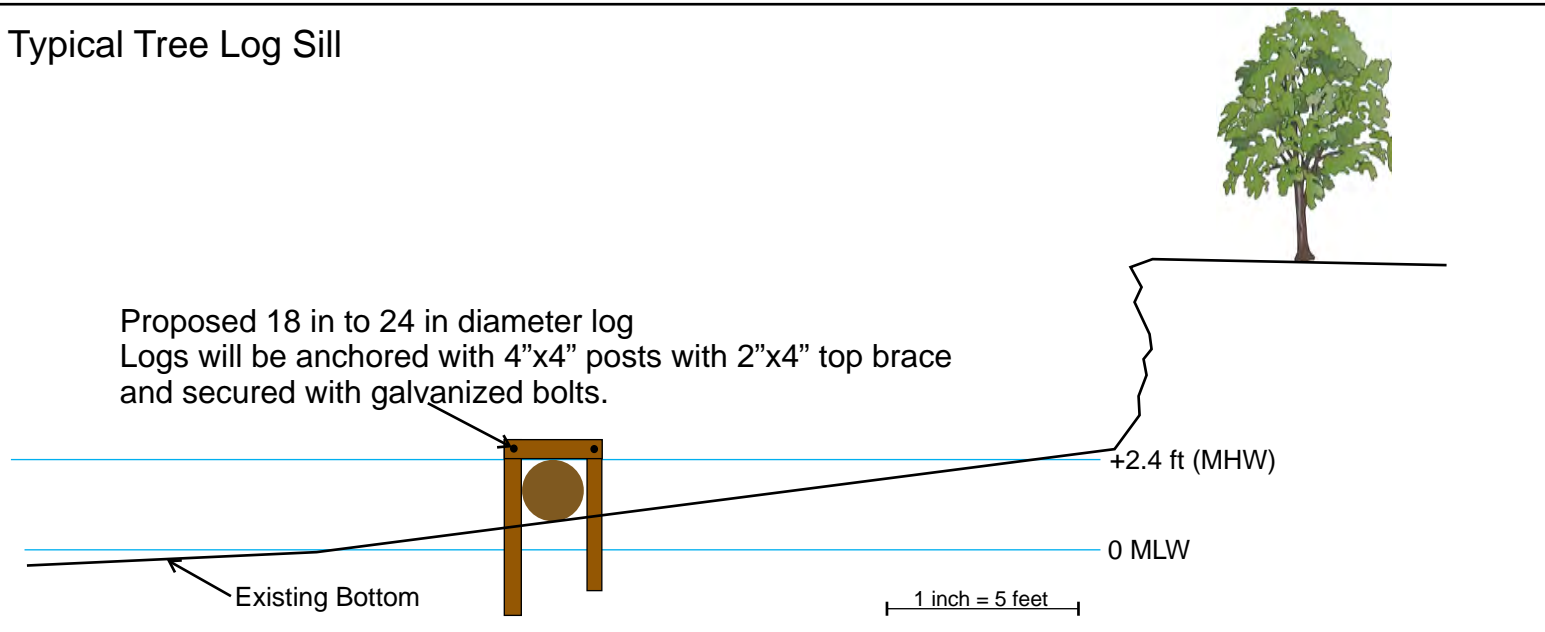
PURPOSE:

DATE: 2/15/2016

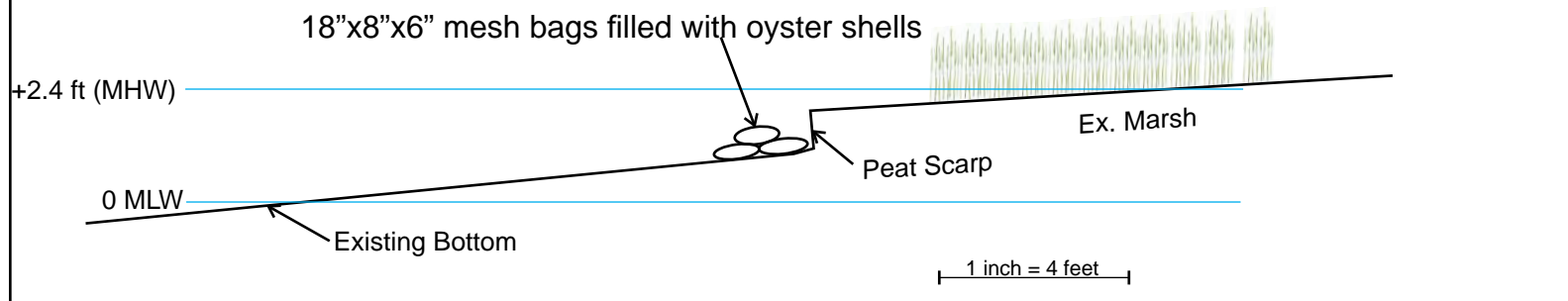
SHEET



## Typical Tree Log Sill



## Typical Oyster Bag Sill



ADJACENT PROPERTY OWNERS:

DATUM:

Captain Sinclair Whittaker Creek Living Shoreline Project  
Typical Cross-Sections

AT:  
IN:

PURPOSE:

APPLICATION BY:

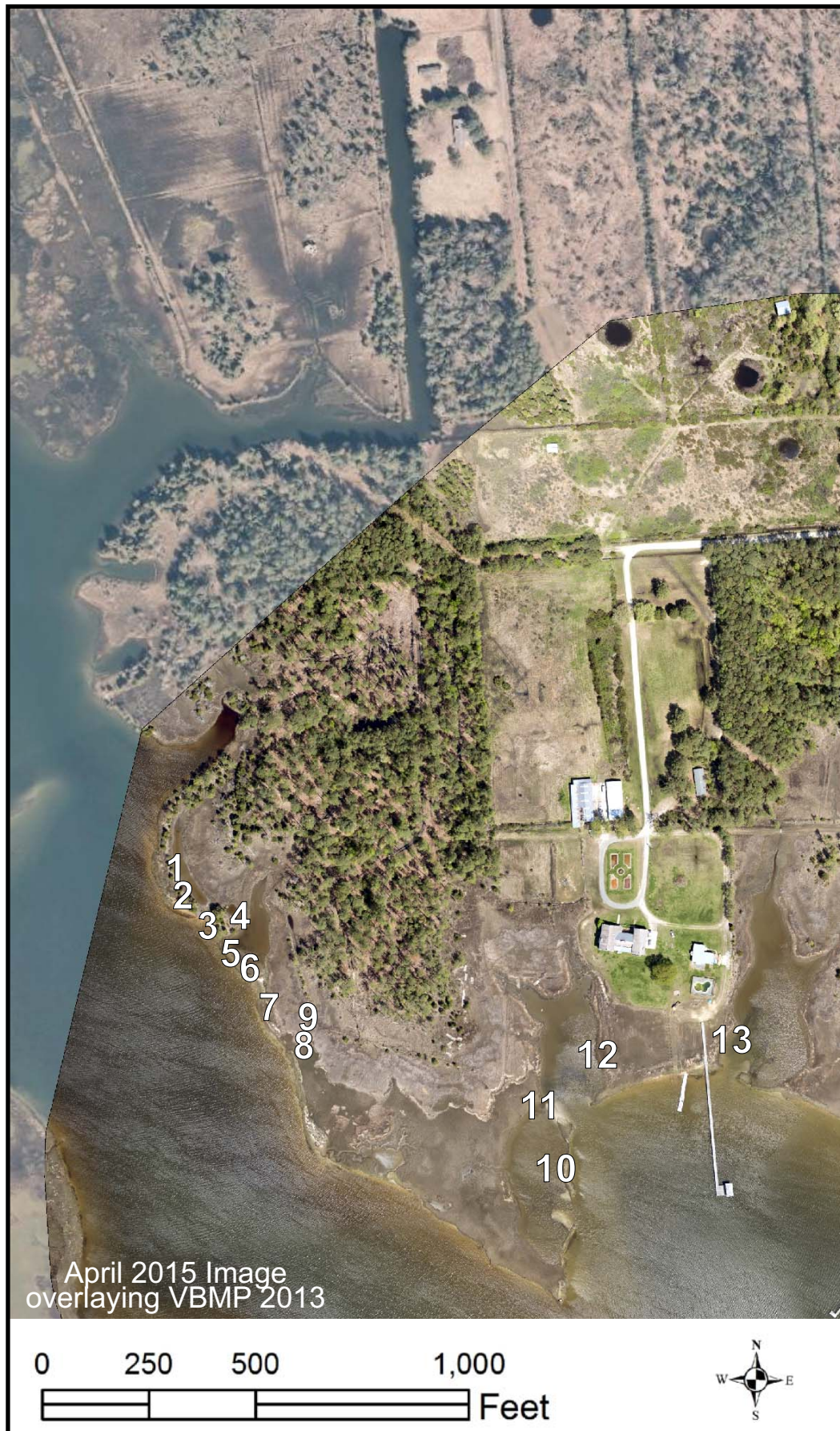
DATE: 2/15/2016

SHEET

## **Appendix C**

### Ground Photos of the Shoreline





Locations of photos.





- 1 Tidal pond formed when material dredged from the canals was placed along the shoreline in the 1960s.



- 2 An eroding upland berm that was formed by the placement of material that was dredged from the canals in the 1960s. Presently, the berm is eroding leaving an exposed bank and trees along the shoreline. This is the location of a small living shoreline project that is in the permitting process. 60 feet of logs will be anchored along the shore.



- 3 Looking south along Whittaker Creek. The marsh spit that fronts a small tidal creek is decaying.



- 4 Looking south along Whittaker Creek. A duck blind can be rented at CPRA.





**5** Looking north along Whittaker Creek showing the marsh spit that is decaying.



**6** Oysters are distributed throughout the marsh at CSRA.



**7** Looking south along Whittaker Creek showing the wide upper marsh with sand washover and a narrow low marsh fringe.



**8** Farther south along Whittaker Creek where the high marsh is changing to low marsh. Water inundates this marsh at high tide.





9 Wide, high marsh along Whittaker Creek.



10 Eroding marsh spit along the east facing point on the Severn River. The spit is eroding quickly and has breached exposing the low marsh behind to increase wave activity.



11 Eroding marsh spit along the east facing point on the Severn River. The marsh has completely disappeared on this section of the spit.





**12** Small tidal creek to the west of the main house on the Severn River. The shoreline is relatively stable in this small creek.



**13** Small tidal creek on the east side of the main house. This shoreline is relatively stable, but it is potentially exposed to a greater wave climate than the creek in photo 12.